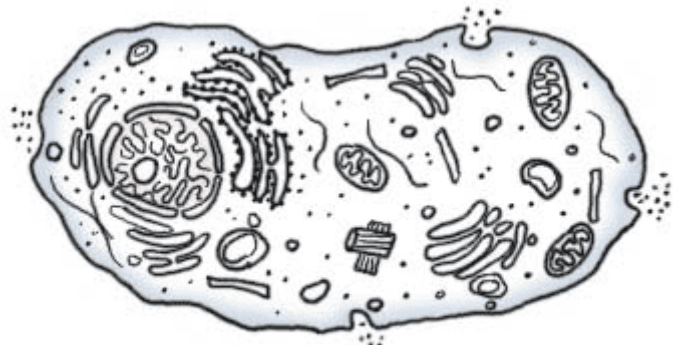


Cells are the Starting Point

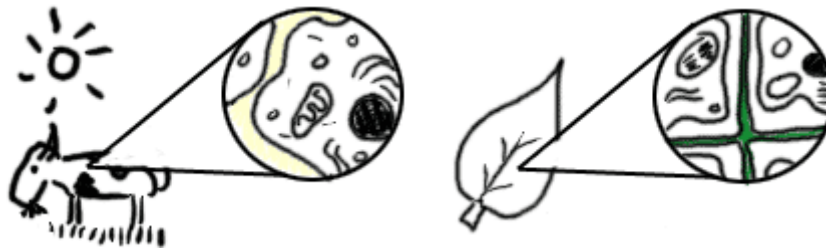
All living organisms on Earth are divided in pieces called cells. There are smaller pieces to cells that include **proteins** and **organelles**. There are also larger pieces called **tissues** and **systems**. Cells are small compartments that hold all of the biological equipment necessary to keep an organism alive and successful on Earth.



AN ANIMAL CELL

A main purpose of a cell is to **organize**. Cells hold a variety of pieces and each cell has a different set of [functions](#). It is easier for an organism to grow and survive when cells are present. If you were only made of one cell, you would only be able to grow to a certain size. You don't find single cells that are as large as a cow. Also, if you were only one cell you couldn't have a [nervous system](#), no [muscles](#) for movement, and using the internet would be out of the question. The trillions of cells in your body make your life possible.

One Name, Many Types



There are many types of cells. In biology class, you will usually work with **plant-like** cells and **animal-like** cells. We say animal-like because an animal type of cell could be anything from a tiny [microorganism](#) to a nerve cell in your brain. Plant cells are easier to identify because they have a protective structure called a [cell wall](#) made of cellulose. Plants have the wall; animals do not. Plants also have organelles like the [chloroplast](#) (the things that make them green) or large water-filled [vacuoles](#).

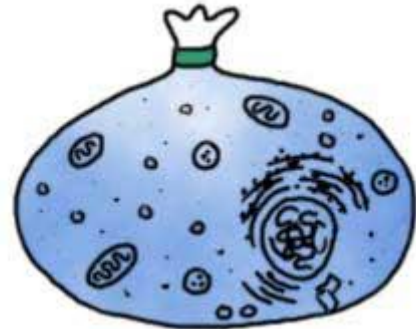


We said that there are many types of cells. Cells are unique to each type of organism. [Humans](#) may have hundreds of types of cells. Some cells are used to carry oxygen (O₂) through the blood (red blood cells) and others might be specific to the heart. If you look at very simple organisms, you will discover cells that have no defined nucleus ([prokaryotes](#)) and

other cells that have hundreds of nuclei (**multinucleated**). The thing they all have in common is that they are compartments surrounded by some type of [membrane](#).

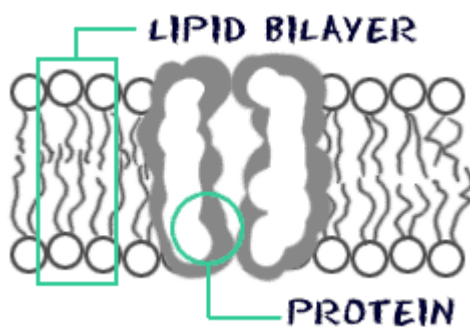
Cell Membranes

We have been talking about cells being a unit of organization in biology. Let's look at the **cell membrane** and see how that membrane keeps all of the pieces inside. When you think about a membrane, imagine it is like a big **plastic bag with some tiny holes**. That bag holds all of the cell pieces and fluids inside the cell and keeps any nasty things outside the cell. The holes are there to let some things move in and out of the cell.



Flexible Containers

The cell membrane is not one solid piece. Everything in life is made of smaller pieces and a membrane is no different. Compounds called **proteins** and **phospholipids** make up most of the cell membrane. The phospholipids make the basic bag. The proteins are found around the holes and help move molecules in and out of the cell.



Scientists describe the organization of the phospholipids and proteins with the **fluid mosaic model**. That model shows that the phospholipids are in a shape like a head and a tail. The heads like water (**hydrophilic**) and the tails do not like water (**hydrophobic**). The tails bump up against each other and the heads are out facing the watery area surrounding the cell. The two layers of cells are called the bilayer.

Ingrained in the Membrane

What about the [membrane proteins](#)? Scientists have shown that the proteins float in that bilayer. Some of them are found on the inside of the cell and some on the outside. Other proteins cross the bilayer with one end outside of the cell and one end inside. Those proteins that cross the layer are very important in the [active transport](#) of ions and small molecules.

Many Membranes

As you learn more about the organelles inside of the cell, you will find that most have a membrane. They do not have the same chemical makeup as the cell membrane. Each membrane is unique to the **organelle**. The membrane that surrounds a [lysosome](#) is different from the membrane around the [endoplasmic reticulum](#). They are both different from the cell membrane.

Some organelles have two membranes. A [mitochondrion](#) has an outer and inner membrane. The outer membrane contains the mitochondrion parts. The inner molecule holds digestive enzymes that break down food. While we talk about membranes all the time, you should remember they all use a basic phospholipid bilayer, but have many other different parts.